POWERMAX™

Laser Power Probes & Instruments

Molectron
DETECTOR, INCORPORATED

As a growing, customer driven Electro-Optics manufacturer located in the heart of the Silicon Forest, Portland, Oregon, we take great pride in our history as a technology leader in Thermal Detectors, Laser Power and Energy Probes, Joulemeters and Power Meters, dating back to 1970.

Innovative Products and A Dedicated Staff

From our Patented Pyroelectric Joulemeter probes to our Innovative PowerMax™ probe technology Molectron is proud of our accomplishments over the years. Our growing staff is dedicated to Excellent Customer Service and it shows in everything we do – you the customer are our top priority!

Our extensive product line now includes Hybrid Pyroelectric Detectors, Radiometric Detector Amplifiers, Pulsed Laser Joulemeters, CW Power Meters, Multichannel Laser Joulemeter/Ratiometer/Controller, Quadrant Position Sensors, and IR Thin Film Wire Grid Polarizers. Our patented Pyroelectric Joulemeter probe technology represents the standard in the marketplace by which other sensors are measured. And our high damage threshold PowerMax™ thermopile probe technology pushed the damage limits to new heights – 100 times the previous damage threshold.

In addition, we provide custom solutions to your specialized measurement needs. We pride ourselves on technological innovation, quality manufacturing, and precise NIST traceable calibration of all Molectron's test and measurement products, and we're dedicated to providing in-depth applications support with our Senior Sales Engineering staff.

LASER POWER PROBES:

- ***High damage threshold probes***
  - ***>26 kW/cm² focused CW***
  - ***5.0 J/cm² Q-switched***
- ***Broad, flat spectral response***
- ***0.19 to 11μm***
- ***Wide dynamic range – 100 μW to10 kW***
- ***Fast response time – from 1 sec***
- ***19, 50, 200 mm diameter sensors***
- ***Air-cooled, water-cooled, and fan-cooled***
- ***Surface and volume-absorbers***
- ***OEM – internal laser power monitors***

Use with the following Lasers and Sources:

- ***Alexandrite***
- ***Argon***
- ***CO and CO_2***
- ***CopperVapor***
- ***CW and pulsed dye***
- ***Diode and DPY***
- ***DUV Excimer***
- ***Erbium:YAG***
- ***HeCd***
- ***HF/DF***
- ***Holmium***
- ***Nd:YAG***
- ***Nd:YLF***
- ***Ruby***
- ***Ti:Sapphire***
- ***Broadband/Blackbody Emmiters***

Laser Power Probes and Meters

Our PowerMax™ products represent the best performance per dollar value of any power meter available on the market today! We have developed a full family of state-of-the-art laser power probes for measurements from 100 µW to 10 kW and from DUV to Far IR; and many accurate, user-friendly Laser Power Meters. From our very economical PM500A to our high precision dual-channel EPM2000, we have the widest selection of laser Power Meters in the world.

Innovative Probe Technology

We have given great attention to thermal disk design. This affects important parameters such as linearity, spatial uniformity, thermal stability, maximum power density and response time. And most noteworthy, through independent testing, we have determined that our broadband surface-absorbing coatings can take up to 26 kW/cm^2 of focused CW YAG laser power, making it the highest damage threshold in the industry.

Our volume-absorbing probes can be pushed to 5 J/cm^2 with a Q-switched 1064 nm Nd:YAG laser!

PowerMax™ probe housings are optimized for maximum heat dissipation. Extra attention was given to electrical grounding and mechanical strain relief of the cables, which ensure EMI/RFI immunity and excellent mechanical integrity. Our probes will stand up to the most demanding of environments and are CE tested. In addition, we designed a unique nonreflecting front bezel which minimizes the chance for specular reflections that could destroy your optics and/or create an eye safety hazard.

All of our standard PowerMax™ probes feature a 25-pin intelligent interconnect that stores calibration, linearity and time constant data for each probe. All digital readouts download the data when connected – no need for tweaking pots. Best of all, they have inter-connectability – all our probes are interchangeable with all of our readouts.

Meeting Your Requirements

Satisfying your laser measurement requirements is an easy task with PowerMax™. First, select a power probe that is capable of handling the power and/or energy of your CW or pulsed laser. Second, select a power meter that has the features you want and meets your budget. It's that simple!

Selecting a PowerMax™ Probe

For your CW laser measurements, first determine the Maximum and Minimum power levels for all lasers to be used. Then select a PowerMax™ probe or two that will handle this entire power range. Use the rule of thumb that the most useful range of a probe is from 0.1% of Maximum rated power to Maximum power (i.e., use our PM150 from 150 mW to 150 W). There are exceptions to every rule, however, so talk to our Applications Engineers if you have any questions. If your CW laser is in excess of 150 W, you may need to select one of our fan-cooled or water-cooled probes.

What about volume absorbing probes? If you are measuring the average power of a short pulse laser (i.e., Q-switched Nd:YAG), where peak power is greater than 100 MW/cm^2, you will want to select the PM10V1 or PM30V1 volume-absorbing probe. These offer the greatest short pulse damage resistance at up to 5 J/cm^2.

Should you have restricted space to put a PowerMax™ probe or have an OEM application with your own electronics, take a look at our OEM products like PM150-50B or PM10-19A. These versatile probes were designed into small, flat packages for use in tight places. The "B" models have a BNC output and can usually be connected to our readouts with the optional PM-BNC connector. The "A" models have a 4-pin MOLEX connector.

Our OEM probes can be used free standing (air-cooled), heat sink mounted or with water cooling to achieve the maximum power rating. If you don't see what you need, just contact one of our Applications Engineers. They'll be happy to help you.

Choose from Three Categories

Our unique, high damage threshold PowerMax™ Probes are designed to provide measurement capabilities for every CW or Pulsed Laser in your facility – from mW to kW and DUV to Far IR. The laser probes can be grouped into three general categories: air-cooled, water-cooled and fan-cooled. On the following pages you'll find descriptions, photos and specifications that will help you in determining which laser power probe and meter combinations fit your specific needs.

Air-Cooled Surface Absorbing Probes, Models PM150, PM150X, PM30, PM10, PM300 and PM150XB

AIR-COOLED SURFACE ABSORBING PROBES

- *range 10 mW to 200 W*
- *broadband 0.19 to 11.0 µm*
- *19 mm and 50 mm diameters*

Models PM2, PM10, PM30 and PM150 are designed for use with low to medium power pulsed and CW lasers – 10 mW to 200 W. They are designed for "stand alone" use with convection cooling.

Within this family of probes you can select between a Broadband or UV Excimer absorbing coating. The first offers uniform spectral response from 0.19 to 11.0 µm, while the Excimer coating is specifically for use from 0.157 to 0.308 µm. Our unique PowerMax coatings show excellent resistance to damage at up to 26 kW/cm^2 for CW lasers and up to 0.6 J/cm^2 for pulse lasers (i.e. Q-switched Nd:YAG).

Air-Cooled Volume Absorbing Probe, Model PM30V1

AIR-COOLED VOLUME ABSORBING PROBES

- *range 10 mW to 50 W*
- *0.25 to 3.0 µm*
- *damage threshold 5.0 J/cm^2 @ 1064 nm*

Models PM10V1 and PM30V1 are designed for use with high peak power Q-switched Nd:YAG lasers at 1064, 532, 355 and 266 nm. The broadband coating is replaced with a volume absorbing Schott glass so that the laser energy is absorbed in the bulk of the glass as opposed to its front surface. This allows you to use these high damage threshold PowerMax probes at up to 5 J/cm^2 (at relatively low rep rates – 10 pps). The glass absorbs the light uniformly from 0.25 to 3.0 µm.

We also designed these probes with a removable front aperture to allow easy replacement of this glass, should it be damaged.

Air-cooled Amplified Probe, Model PM3

AIR-COOLED AMPLIFIED PROBE

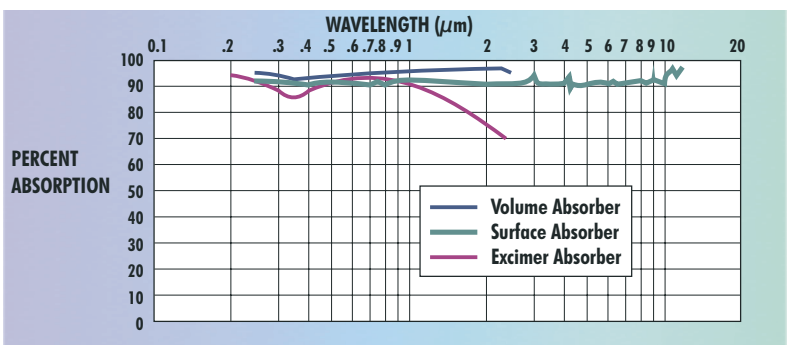
- *high sensitivity 100 mV/W*
- *range 100 µW to 2 W*
- *broadband 0.19 - 11 µm*

Model PM3 is a unique, high output thermal probe that features a proprietary thermal disk design. Its thin cross-section disk and matched preamplifier make it the most sensitive thermal probe on the market.

Measure down to 100 µW with 10 µW resolution. It's very well suited for measuring the power of your laser diodes, diode-pumped YAG lasers, HeCd or Argon. And unlike Silicon detectors, it will not saturate and go non-linear at > 1mW/cm^2.

It comes with a 11 mm diameter light tube – which helps cut down on thermal background; however, you can remove this to make use of the entire 19 mm diameter absorbing surface.

We also offer Model PM3Q that includes a wedged quartz window for measurements below 1 mW. It replaces the light tube.



Relative Spectral response of Molectron's Laser Power Meter Probes.

Fan Cooled Surface Absorbing Probes, Models PM200F and PM300F

Water-Cooled Surface Absorbing Probes, Models PM1K, PM5K,PM150-50C and PM10-19C

OEM Power Probes, Models PM10-19B, PM150-19B, PM150-50A and PM10-19A

FAN-COOLED SURFACE ABSORBING PROBES

- *high power 300 W*
- *compact design*
- *wall charger powered*
- *large area 19 mm and 50 mm*

Our fan-cooled products bridge the gap between air-cooled and water-cooled probes. The PM200F and PM300F measure up to 200 W and 300 W respectively and are smaller than our PM150 air-cooled probe. A compact wall mount power supply provides the 12 V DC required to run the low noise, brushless fan.

PM200Fand PM300F feature a 19 mm or 50 mm broadband absorber; or choose our 50 mm probe with UV Excimer absorber (PM300F-50X).

These laser probes are an excellent choice for Field Service Engineers measuring mid power lasers to 300 W and from the DUV to Far IR, where size and reliability can be a concern.

WATER-COOLED SURFACE ABSORBING PROBES

- *high power to 10 kW*
- *excellent linearity, 1%*
- *large area 50 mm - 200 mm*
- *high damage, 26 kW/cm²*

This is our toughest family of laser probes designed to stand up to those hot, high-powered industrial CO_2 and YAG lasers. With water cooling and careful thermal designs, we're able to measure laser power precisely and linearly to 10 kW.

Our PM1K has been thoroughly tested by *NIST* and is now used as a "transfer standard" for their kW calibration service – that says plenty about the precision and quality of this family of kW probes.

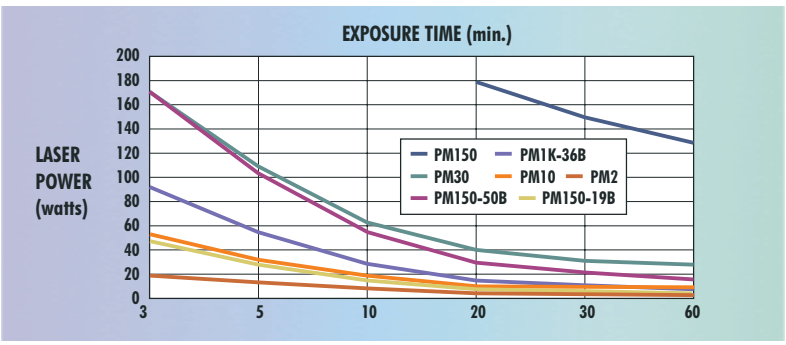
We own and operate a kW laser in our facility that is used as a source to calibrate these probes, traceable to NIST. We're please to help you with your tough kW measurements.

OEM POWER PROBES

- *small compact design*
- *air or water-cooled*
- *19 mm and 50 mm aperture*
- *custom designs*
- *cost effective*

We are the leading supplier of OEM thermal power probes around the world. We have designed a variety of probes that cover a majority of your laser measurement needs – from 10 mW to 1 kW, DUV to far IR and mW/cm² to kW/cm². Select from discrete or amplified probes depending on your electronic requirement. If we don't have what you need today, we'll be happy to design a custom laser probe that fits your needs perfectly – we thrive on it!

We understand lasers, optics, sensors, instrumentation and calibration and can provide excellent Applications Engineering support when you need it.



Maximum Laser Power vs Exposure Time of PowerMax Probes
(Assumes maximum probe temperature of 80° C.)

Air-Cooled Power Meter Probes *(Surface Absorbers)*

Probe Type and Model No.	PM2	PM3 PM3Q*	PM10	PM30	PM150 PM150-50	PM150X (for UV)
Spectral Range	0.19 - 11 µm	0.19 - 11 µm*	0.19 - 11 µm	0.19 - 11 µm	0.19 - 11 µm	0.19 - 1.0 µm
Max Power (air-cooled)	2 W	2 W	10 W	50 W	150 W	150 W
Max Intermittent Power (<5 min)	3 W	3 W	30 W	100 W	300 W	300 W
Resolution	1 mW	10 µW!	1 mW	10 mW	30 mW	30 mW
Max Average Power Density (Note 1)	26 kW/cm²	0.5 kW/cm²	26 kW/cm²	26 kW/cm²	26 kW/cm²	26 kW/cm²
Pulse Energy Density (10 ns)	0.6 J/cm²	50 mJ/cm²	0.6 J/cm²	0.6 J/cm²	0.6 J/cm²	0.6 J/cm²
System Response Time (1/e)	1 sec	1-3 sec	1 sec	1 sec	1 sec (2 sec)	2 sec
Accuracy	± 3%	± 3%	± 3%	± 3%	± 3%	± 5%
Clear Aperture	19 mm	19 mm	19 mm	19 mm	19 mm (50 mm)	50 mm
Probe Size (a. height/width/depth b. dia/depth)	1.8" x 2" x .4" (a)	2.5" x 1.5" (b)	2.5" x 1.5" (b)	4" x 2.5" (b)	6" x 5" (b)	6" x 5" (b)

*0.19 - 3µm

High Peak Power Probes *(Volume Absorbers)*

Probe Type and Model No.	PM10V1	PM30V1
Spectral Range	0.25 - 3.0 µm	0.25 - 3.0 µm
Max Power (air/water-cooled)	10 W	30 W
Max Intermittent Power (<5 min)	15 W	50 W
Resolution	1 mW	10 mW
Max Average Power Density	50 W/cm²	50 W/cm²
Pulse Energy Density (10 ns)	5-10 J/cm²	5-10 J/cm²
System Response Time (1/e)	3 sec	3 sec
Accuracy	± 3%	± 3%
Clear Aperture	19 mm	19 mm
Probe Size (a. height/width/depth b. dia/depth)	2.5" x 1.5" (b)	4" x 2.5" (b)

Compact Air/Water-Cooled Probes *(Surface Absorbers)*

Probe Type and Model No.	PM10-19C	PM150-19C	PM150-50C	PM150-50XC
Spectral Range	0.19 - 11 µm	0.19 - 11 µm	0.19 - 11 µm	0.19 - 1.0 µm
Max Power (air/water-cooled)	10 W	150 W	150 W	150 W
Max Intermittent Power (<5 min)	20 W	300 W	300 W	300 W
Resolution	1 mW	10 mW	10 mW	10 mW
Max Average Power Density	26 kW/cm²	26 kW/cm²	26 kW/cm²	26 kW/cm²
Pulse Energy Density (10 ns)	0.6 J/cm²	0.6 J/cm²	0.6 J/cm²	0.6 J/cm²
System Response Time (1/e)	1 sec	1 sec (3 sec)	1 sec (3 sec)	3 sec
Accuracy	± 3%	± 3%	± 3%	± 5%
Clear Aperture	19 mm	19 mm	50 mm	50 mm
Probe Size (a. height/width/depth b. dia/depth)	2" x 2" x 1.2" (a)	2" x 2" x 1.2" (a)	3.5" x 3.5" x 1.5" (a)	3.5" x 3.5" x 1.5" (a)

High Average Power Fan-Cooled Probes

Probe Type and Model No.	PM200F-19 PM200F-50*	PM300F-19 PM300F-50*
Spectral Range	0.19 - 11 µm	0.19 - 11 µm
Max Power (continuous)	200 W	300 W
Max Intermittent Power (<5 min)	300 W	450 W
Resolution	100 mW	100 mW
Max Average Power Density (Note 1)	26 kW/cm²	26 kW/cm²
Pulse Energy Density (10 ns)	0.6 J/cm²	0.6 mJ/cm²
System Response Time (1/e)	2 sec (4 sec)	2 sec (4 sec)
Accuracy	± 3%	± 3%
Clear Aperture	19 mm (50 mm)	19 mm (50 mm)
Probe Size (a. height/width/depth b. dia/depth)	4" x 4" x 4.5" (a)	5" x 5" x 5" (a)

*can be excimer (X) coated

Water-Cooled Probes *(Surface Absorbers)*

Probe Type and Model No.	PM300	PM1K	PM3K	PM5K
Spectral Range	0.19 - 11 µm	0.19 - 11 µm	0.19 - 11 µm	0.19 - 11 µm
Max Power (continuous)	300 W	1000 W	3000 W	5000 W
Max Intermittent Power (<5 min)	450 W	1500 W	4000 W	7500 W
Resolution	3 W	10 W	10 W	10 W
Max Average Power Density (Note 1)	26 kW/cm²	26 kW/cm²	26 kW/cm²	26 kW/cm²
Pulse Energy Density (10 ns)	0.6 J/cm²	0.6 J/cm²	0.6 J/cm²	0.6 J/cm²
System Response Time (1/e)	1 sec	6 sec	6 sec	9 sec
Accuracy	± 5%	± 5%	± 5%	± 5%
Clear Aperture	19 mm	50 mm	50 mm	50 mm
Probe Size (a. height/width/depth b. dia/depth)	3" x 2" (b)	4" x 3" (b)	4" x 3" (b)	4" x 3" (b)

OEM Power Meter Probes

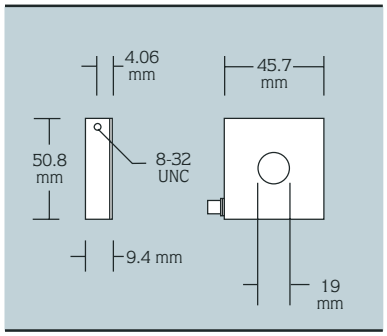
Probe Type and Model No.	PM10-19B	PM10-19A	PM150-19B	PM150-19A	PM1K-36B	PM150-50B	PM150-50XB
Spectral Range	0.19 - 11 µm	0.19 - 11 µm	0.19 - 11 µm	0.19 - 11 µm	0.19 - 11 µm	0.19 - 11 µm	0.19 - 1.0 µm
Max Power (water-cooled)	20 W	10 W	150 W	150 W	1 kW	150 W	150 W
Max Intermittent Power (air-cooled)	10 W	2 W	30 W	20 W	15 W	15 W	15 W
Voltage Responsivity	1 mV/W	1 V/W	0.4 mV/W	40 mV/W	0.1 mV/W	0.4 mV/W	0.4 mV/W
Max Avg Power Density (Note 1)	26 kW/cm²	26 kW/cm²	26 kW/cm²	26 kW/cm²	26 kW/cm²	26 kW/cm²	26 kW/cm²
Pulse Energy Density	0.6 mJ/cm²	0.6 J/cm²	0.6 J/cm²	0.6 J/cm²	0.6 J/cm²	0.6 J/cm²	0.6 J/cm²
Response Time (1/e)	3 sec	1 sec	3 sec	1 sec	6 sec	3 sec	3 sec
Accuracy	± 3%	± 3%	± 3%	± 3%	± 5%	± 3%	± 5%
Clear Aperture	19 mm	19 mm	19 mm	19 mm	36 mm	50 mm	50 mm
Probe Size (h/w/d)	2" x 2" x 1.2"	2" x 2" x 1.5"	2" x 2" x 1.2"	2" x 2" x 1.5"	3.25" x 3.25" x .75"	3.5" x 3.5" x 1.3"	3.5" x 3.5" x 1.3"

NOTES:

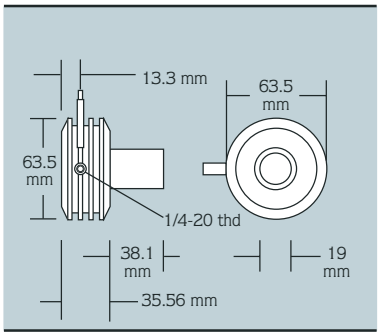
1. Maximum Average Power Densities assume uniform beam distribution at 50% of the Maximum Power specification. Slight cosmetic damage may occur as low as 3 kW/cm² which does not significantly affect the absorption and therefore probe calibration.

Probe Specifications

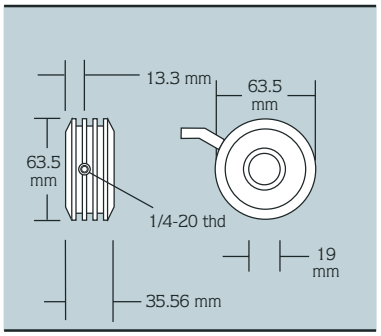
PM2



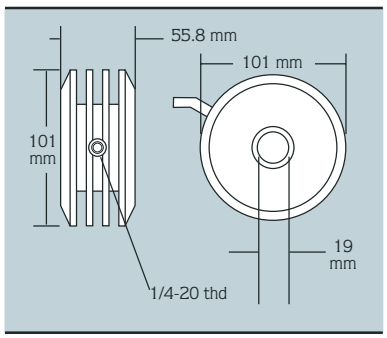
PM3/PM3Q



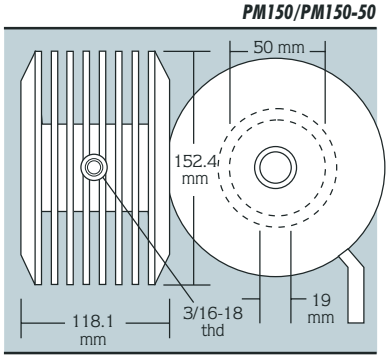
PM10/10V1



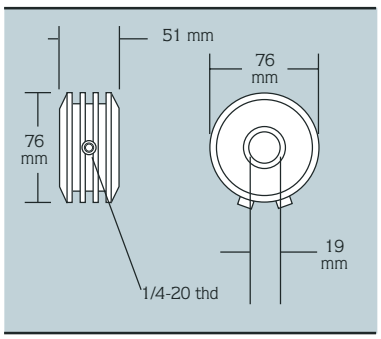
PM30/30V1



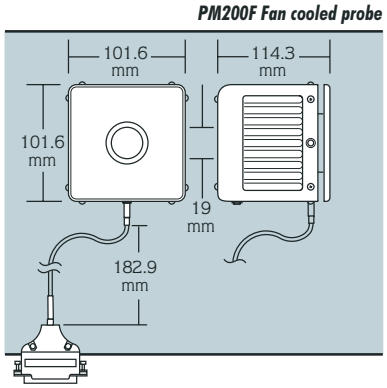
PM150/PM150-50



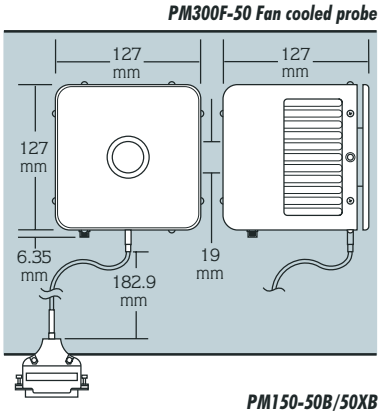
PM300



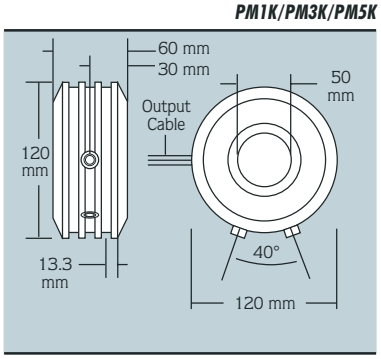
PM200F Fan cooled probe



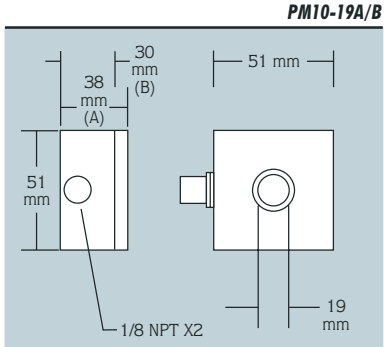
PM300F-50 Fan cooled probe



PM1K/PM3K/PM5K

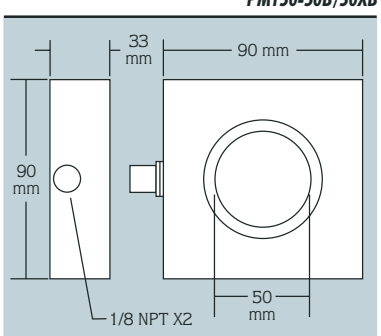


PM10-19A/B

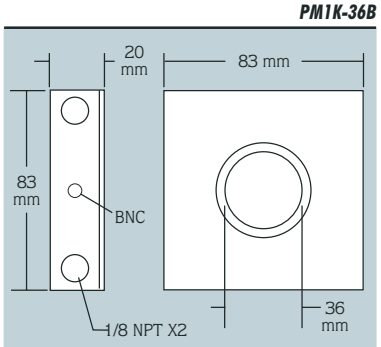


PM150-19A/B

PM150-50B/50XB



PM1K-36B



Calibration

It is critical, when choosing a laser power meter product that you, the user, have a clear understanding of the calibration methodology, standards and traceability. In the following paragraphs we will help you understand the Calibration approach that we take at Molectron.

Calibration Methods

When calibrating our PowerMax probes we use one of two methods that are well documented, recommended by NIST and that conform to the ISO9002 guidelines.

For most of our Surface and Volume absorbing PowerMax probes we calibrate them using an "Optical Substitution Method" performed at 514 nm. The output of our probe is determined by comparing it to a NIST traceable working standard in front of a very stable CW argon laser (stability <1%). The "working" standard is in turn calibrated against a "golden" standard which is calibrated by NIST annually.

Our kW PowerMax probes, which require water cooling, are calibrated using a second method that incorporates the use of a 0.5 kW Nd:YAG laser at 1064 nm. Each kW probe is calibrated directly against a PM1K that is calibrated by NIST annually. The laser output is stable to <1%.

Calibration Certificate

NIST traceable calibration is included with each PowerMax probe you purchase. The probe comes with a Certificate of Calibration that includes the Voltage Responsivity of the probe (in mV/W), the wavelength of calibration, the date of calibration and due date for recalibration, and a listing of the NIST traceable standard used for this purpose. The test data for each product is stored in our ISO compliant MetTrak calibration data base.

In our industry it is highly recommended that your laser power meter probe be calibrated at least annually or at anytime that you feel it may have been damaged by use. Both the probe and the paperwork indicate the recalibration due date. We will automatically notify you prior to this date to help keep your calibrated power probes current.

When you're ready to return your power meter to Molectron for recalibration, please call our Sales Department and ask for an RMA #. We will fill out the appropriate form which will facilitate the process. It normally takes one week or less to calibrate your power probe.

Full Calibration Services

In addition to calibration at 514 nm and 1064 nm we offer calibration at the following wavelengths:

- 193 nm
- 248 nm
- 266 nm
- 532 nm
- 694 nm
- 2100 nm
- 2940 nm

The calibration method for the above wavelength lasers may include use of a "wavelength" factor derived from NIST traceable relative spectral absorbance data taken on our Broadband Absorbers. Though the calibration uncertainty will be somewhat greater than at 514 nm and 1064 nm these are still NIST traceable calibrations.

We work closely with NIST Boulder, CO on all optical calibration matters and strive to continually improve our methods, standards and documentation.

Our laser resources are extensive and our calibration facilities are "state-of-the-art". If you have a unique calibration requirement we are happy to work with you to develop a new method and standard.

PowerMax Accessories

We are pleased to offer the following accessories to aid in the use of our PowerMax Laser Power Meter products:

Model PSH-2
Large Horizontal Post and Stand. Composed of an 8-inch diameter base, 16-inch vertical mast, 5-inch cross bar and adjustable holder. One of these is included with each PM150, PM150-50, PM1K, PM3K and PM5k. Additional units are available for sale.

Model PSL
Composed of a 4-inch x 5-inch base that can stand alone or be bench mounted. It has an attached collar and 5-inch post. Models 200F and 300F series include one of these.

Model PSS
Standard Post and Stand. Composed of a 3-inch x 4-inch base that can stand alone or be bench mounted. It has an attached collar and 5-inch post. One is included with most air-cooled probes.

To facilitate transport of the PowerMax products, you may want to select a carrying case. Each case will accommodate one readout and at least one small probe.

Model JC-5
Carrying case for PM500A, PM500A-2, PM500D and PM500D-2.

Model JC-20
Carrying case for EPM1000,

A Full Line of Instruments

As experts in Thermal detector technology we have complete understanding of what it takes to design analog and digital electronics that mate to our PowerMax probes and accurately convert DC voltage to a precise Power reading in Watts. We have designed a whole family of calibrated Analog and Digital Laser Power Meters for you to use.

Our PowerMax instruments include a smart probe connection, analog and digital displays, analog output and in some cases digital output in RS-232 or IEEE-488 format. We calibrate each instrument using an ISO9002 compliant procedure and against a NIST traceable DC voltage meter. You receive a Calibration Certificate that includes date calibrated, NIST nos. and date for recalibration.

Metrology is one of our core technologies and we excel at it.

Selecting A Power Meter

We've tried to make selecting a Laser Power Meter easy for you with a few basic models that mate with ALL of our PowerMax probes – that's right, every probe is compatible with every meter!

The first consideration is – *"Where am I going to use this Meter?"* If you're thinking about use in the field, you should consider something small, battery operated and fairly rugged – like our PM500A, PM500D and the "-2" versions. These units are small, portable and offer both Analog meter for laser tweaking or Digital meter for quantitative measurements. The "-2" option adds an analog output and wall mounted power supply.

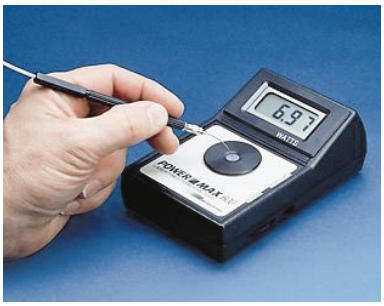
"What kind of user features do I need?" Perhaps you're interested in a laboratory model if you need a more fully featured product and AC power is readily available. You should consider our PM5100 and PM5200 models. The 5100 is a dedicated Analog Meter device which is great for tuning your laser, while the 5200 is both Analog and Digital with speed-up and wavelength controls. Both feature backlit meters and can be powered with a wall charger/supply. PM5200 even includes RS-232 and great Applications Software – PM52APS.

"What about my future needs?" Should you want something that is most versatile and expandable with your needs, you should consider the EPM1000/2000 series products. This family of instruments works as both a Power Meter and Joulemeter. You benefit from the best of both worlds – analog and digital; power and energy. Both meters come with RS-232 and IEEE-488. Once again, the EPM series can be used with every PowerMax probe we make, and can measure, therefore, from 100 µW to 10 kW.

If you have any questions or need further guidance on which products best suit your needs, just call 1-800-366-4340 or visit our website at *www.molectron.com*.

LASER POWER METERS:

- ***Wide dynamic ranges 3 mW to 10 kW***
- ***Auto ranging (PM5200, EPM)***
- ***Precise mirrored, backlit analog meter***
- ***Backlit dot matrix LCD display (PM5200, EPM)***
- ***Intelligent probe interconnection***
- ***Visible and audible overtemp indicator***
- ***Zero, offset control***
- ***2 V analog output***
- ***AC/DC operation***
- ***Digital wavelength correction (PM5200, EPM1000, EPM2000)***
- ***RS-232 computer interface (PM5200, EPM1000, EPM2000)***
- ***GPIB IEEE-488 interface (EPM1000, EPM2000)***
- ***Small, compact, EMI/RFI immune package***
- ***Applications software***
- ***LabView® drivers***



PM600 Laser Fiber Power Meter

PM600 LASER FIBER POWER METER

- *compact 20 W power meter*
- *broadband response from 0.3 to 11.0 µm*
- *simple operation*
- *ideal for medical and dental lasers*

The PM600 is used by laser engineers, service technicians, medical and dental professionals to measure the power output of their laser fiber. It's an effective tool for solving many routine problems.

Is your laser system performing as expected? Is your fiber cleaved properly? Why aren't the results of the laser procedure the same as the last time? These questions and more can be answered in seconds using our unique PM600 Power Meter.

PM600 features a large thermal sensor, solid-state electronics, battery operation and 3 ½ digital display. Its front Quartz window can be replaced with a standard SMA fiber connector for hands-off use.

PM600 – your daily measure of confidence!

PM500A and PM500D Analog and Digital Power Meters

PM500A/D ANALOG/DIGITAL POWER METER

- *compact and light weight*
- *15 ranges – 1 mW to 10 kW*
- *fast, mirrored analog meter (A)*
- *3 ½ digit LCD (D)*
- *analog output option*
- *low cost*
- *ideal for field service*

These small rugged Power Meters are ideal for use in the field. They mate to all of our PowerMax probes and cover an incredible power range from 1 mW to 10 kW (FS). Powered by a standard 9V battery (readily available worldwide) they're convenient to use, EMI immune and always reliable.

PM500A features a fast analog meter – great for laser tweaking; PM500D offers a large (0.7 inches) digital display to increase precision and eliminate the guess work. Both products can be set up with an analog output by specifying the "-2" option which includes a wall mount DC supply and 0-2 V analog output.

The PM500 family make a great choice whether measuring the power of medical, industrial, semiconductor, telecommunication or scientific lasers.

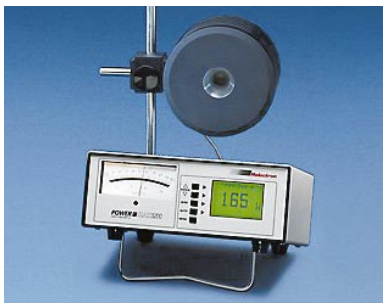
PM5100 Analog Laser Power Meter

PM5100 ANALOG POWER METER

- *precision analog meter*
- *12 ranges - 30 mW to 10 kW*
- *analog output*
- *intelligent probe connection*
- *overtemp alarm*
- *economical*

The PM5100 features a precision, mirrored, backlit analog meter for easy reading and excellent laser tuning. Connect any PowerMax probe we make and measure from mW to kW. Track your laser output over time with our handy 0 to 2 V analog output. Carry this light weight, compact, rugged instrument from lab to production floor wherever you need it. Plug it in or power it off its NiCAD batteries – your choice.

Plug in your PowerMax probe and the PM5100 sets the min/max range and beeps at the user should it exceed either. Compensate for the thermal background using the convenient "ZERO" knob and you're ready to make accurate, NIST traceable laser power measurements.



PM5200 Analog/Digital Laser Power Meter

PM5200 ANALOG/DIGITAL POWER METER

- analog meter for tweaking
- digital display for precision
- 12 ranges – 3 mW to 10 kW
- auto range
- wavelength correction
- RS-232 interface/Analog output
- dedicated Apps Software/LabVIEW® drivers

Our PM5200 is ideally suited for lab and automated test applications. You get the best of both worlds – a fast response analog meter for laser tuning and a dot matrix LCD for precise digital readings. The LCD provides menu-based soft functions for easy set up.

The PM5200 takes full advantage of our intelligent probe design. Connect a PowerMax probe and it sets range limits, speed-up factor and calibration factor, and stores a wavelength look-up table. It makes power measurements look easy!

Lets not forget the dedicated Applications Software PM-APS that comes as part of the bargain. Measure, store and analyze your laser power output in real time with this stand-alone program. (See Software section on page 14 for more details.)

You're going to like our PM5200!

EPM1000 Laser Energy/Power Meter

EPM1000 LASER ENERGY/POWER METER

- Power or Energy
- RS-232
- GPIB
- read V, W, J, Hz
- LabVIEW® drivers
- ranges – 3 mW to 10 kW
- display min, max, avg, std dev
- autorange
- wavelength correction
- analog and digital displays

Designed to meet your most demanding laser measurement requirements in your lab or on the production floor, the EPM1000 is the right choice. It is two meters in one – a precise Power meter and a fast Joulemeter. This single-channel meter mates to every PowerMax probe we make and covers your power measurement needs from 100 µW to 10 kW. It also mates to all of our pyroelectric probes for pulse-to-pulse energy measurements. For long pulse lasers (i.e. msec to sec) it measures energy by pushing the J button (Joules).

The combination of a fast analog meter and large, custom LCD display with direct access to primary function buttons make the EPM1000 an intuitive, powerful instrument.

It also features live "STATS" mode where you can measure laser power over a selectable time and view "min", "max", "avg" and "std dev". Measure in a running or hold mode – now that's power!

EPM2000 Laser Energy/Power Meter

EPM2000 DUAL CHANNEL ENERGY/POWER

- 2 CH Energy and Power
- RS-232
- GPIB
- read V, W, J, Hz
- LabVIEW® drivers
- ratio A/B or B/A
- display min, max, avg, std dev
- ranges – 3 mW to 10 kW
- autorange
- two digital displays

Like its brother (EPM1000), this dual-channel EPM2000 Energy/Power Meter offers unsurpassed performance, features and versatility. It is both a Power Meter and a Joulemeter, two Power Meters, or two Joulemeters – take your pick.

Its large backlit, custom LCD display makes it easy to read power from across the lab. Its dual set of function buttons allows quick and easy set up for two channel measurements: select V, J, or W for CHA and CHB; set trigger CHB to "slave", and punch A/B or B/A – you're now in ratio mode. It's that easy!

Need to automate your test and data collection? Set up a LabVIEW® program using RS-232/IEEE-488 and EPM2000 LabVIEW® drivers. Need help? Call our Senior Applications Engineers. They'll be happy to assist you.

Instrument Performance Specifications

Instrument Model	EPM2000	EPM1000	PM500A (A-2)	PM500D (A-2)	PM5100	PM5200	PM600
System Accuracy	±3%	±3%	±5%	±5%	±5%	±3%	±5%
Electronic Accuracy							
with Analog Meter	± 2%	± 2%	± 2%		± 2%	± 2%	
with Digital Meter	± 1%	± 1%		± 1%		±1%	±1%
Maximum Full Scale Power	10 kW	10 kW	10 kW	10 kW	10 kW	10 kW	20 W
Minimum Full Scale Power	3 mW	3 mW	1 mW	1 mW	30 mW	3 mW	0.1W
Minimum Resolution[1]	10 µW	10 µW	10 µW	10 µW	1mW	1µW	10 mW
Response Time[2]	1 - 6 sec	1 - 6 sec	2 - 6 sec	2 - 6 sec	2 - 6 sec	1 - 6 sec	3 sec
Energy Range[2]	1 pJ - 3 kJ	1 pJ - 3 kJ					
Voltage Range (Thermopile)	10 µV - 30 V	10 µV - 30 V					
Voltage Range (Pyroelectric)	3 mV - 30 V	3 mV - 30 V					
Analog Output Range	0 - 2 V	0 - 2 V	0 - 2 V	0 - 2 V	0 - 2 V	0 - 2 V	
Resolution	12 bit	12 bit	12 bit	12 bit	12 bit	12 bit	
Accuracy	±1%	±1%	±1%	±1%	±1%	±1%	
Battery Life			> 100 hrs	> 100 hrs	> 100 hrs	8 hrs	> 100 hrs
Dimensions	12" x 9" x 4"	12" x 9" x 4"	4" x 7.5" x 2"	4" x 7.5" x 2"	4" x 7" x 6"	9.5" x 8.5" x 4"	
Maximum Rep Rate with Pyroelectric	1200 pps	1200 pps					

Instrument Features

Instrument Model	EPM2000	EPM1000	PM500A (A-2)	PM500D (A-2)	PM5100	PM5200	PM600
Measures:							
Average Power	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pulse Energy[3]	Yes	Yes				software	
Display Type:							
Precision Analog Meter	Yes	Yes	Yes		Yes	Yes	
7 Segment LCD	4 digit	4 digit		3.5 digit			3.5 digit
Dot Matrix LCD						3 digit	
Computer Interfacing:							
RS232	Yes	Yes				Yes	
GPIB488	Yes	Yes					
Software available	Yes	Yes				Yes	
Analog Output	Yes	Yes	Yes (-2)	Yes (-2)	Yes	Yes	
Portable/Hand Held			Yes	Yes			Yes
Battery Operation			9V	9V	NiCad	NiCad	9V
AC Adapter	Yes	Yes	Yes (-2)	Yes (-2)	Yes	Yes	
UI Format:							
Dials			Yes	Yes	Yes		Yes
Buttons	Yes	Yes				Yes	

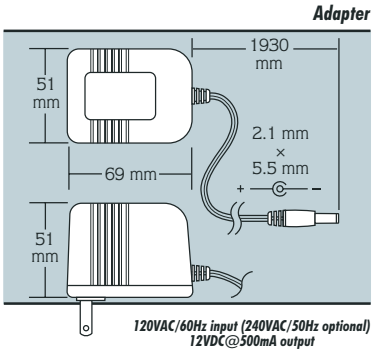
NOTES:

1. Best power resolution obtained with PM3 Detector

2. Probe specific

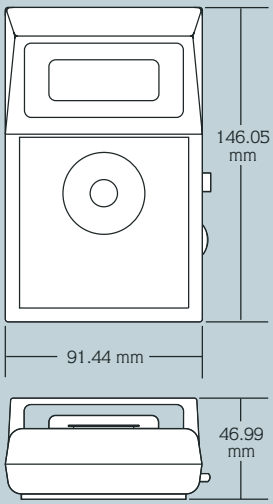
3. For more information about Pulse Measurement, call Molectron at 1-800-366-4336, to inquire about our JouleMax products.

Adapter

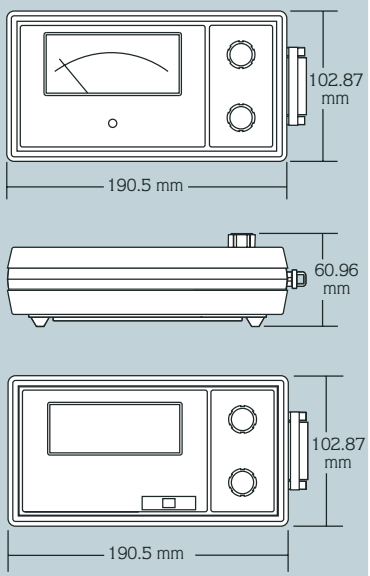


120VAC/60Hz input (240VAC/50Hz optional)
12VDC@500mA output

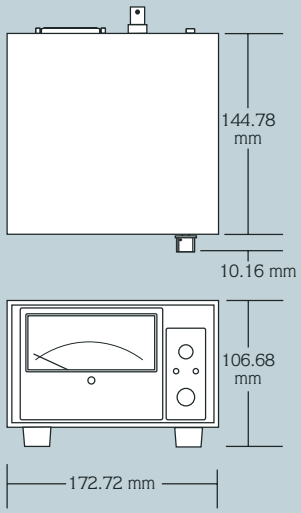
PM600



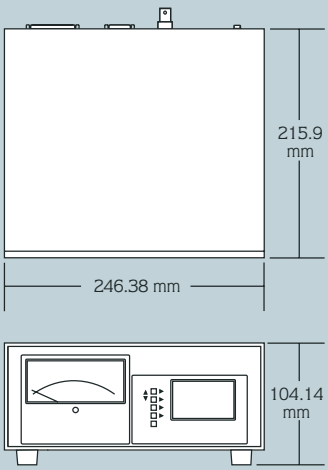
PM500A/D



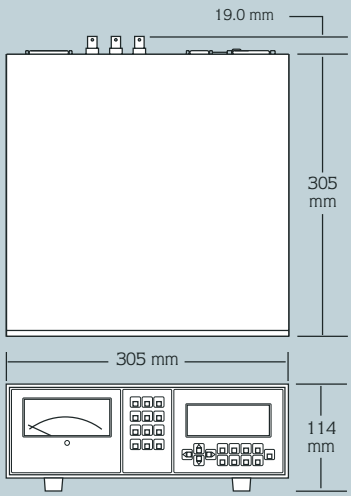
PM5100



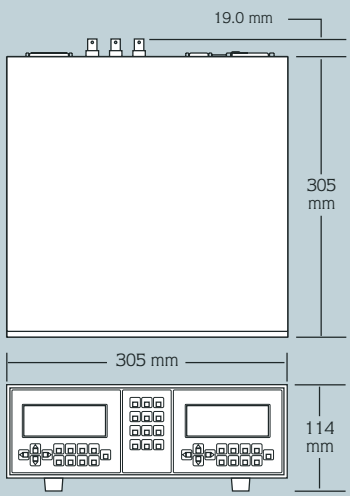
PM5200



EPM1000



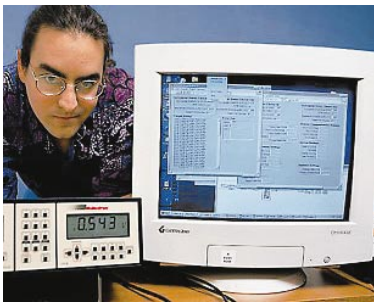
EPM2000



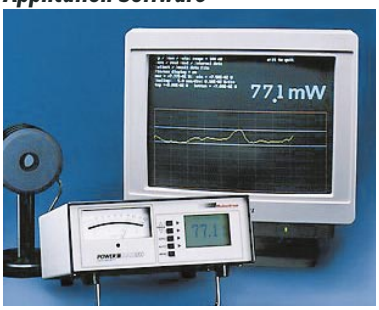
Computer Interface/Software

Communications Protocols

LabVIEW® Drivers



Application Software



Communication Protocols

Molectron Power Meters such as the EPM1000 and the PM5200 can be controlled easily via remote interfaces (RS-232 or GPIB) using their individual *Communications Protocol.* The instrument's Protocol often includes features that are not available from the instrument's front panel, allowing a greater degree of programmability. Data acquired from any of Molectron's equipment can be easily ported to the analysis package or data file type of your choice. Connecting to an instrument from your PC is a snap, using a terminal program such as Microsoft's HyperTerminal® or National Instrument's LabVIEW® software.

LabVIEW® Drivers

Molectron Detector, Inc. now offers LabVIEW® drivers for such instruments as the EPM1000 and EPM2000 Laser Energy/Power Meters.

These software toolkits contain small Virtual Instruments (VIs) to control and monitor every action and function of the instrument. Combine these tools to build more complicated VIs and to program an instrument with any possible configuration. Build custom VIs for your specific application or use any one of a variety of example instruments included with the kits. Both the drivers and examples are laden with detailed explanations, notes and programming hints.

Download these drivers from Molectron's website: *http://www.molectron.com* or contact Molectron directly for more information. Check the website regularly – new features, software and examples are added all the time!

PM52APS Applications Software

We have developed custom application software, model PM52APS, to provide maximum flexibility when using the PM5200 Digital Power Meter. This software will run on any IBM compatible PC, using the RS-232 serial port for two-way communication. This program gives you a live strip chart display of the power readings in real time, with any choice of power and period scaling. The current reading is also displayed in large, highly legible numbers. Readings may be logged to an ASCII data file for any desired period, and then plotted and analyzed either in PM52APS or your favorite spreadsheet or graphics program.

Our PM52APS Software puts you in complete control of your laser power measurement application. It can make you more efficient and certainly enhances the accuracy of the measurement with automated data logging and statistical analysis.

Quality – A Strategic Advantage

Molectron is dedicated to making quality a strategic advantage. In order to make this happen over the past year Molectron has committed significant resources to improving and automating our manufacturing, calibration, and design systems. We have worked closely with our customers, calibration labs, and NIST to come up with innovative ways to more accurately and efficiently manufacture and calibrate our products. This year we expect to culminate this effort by becoming certified to the ISO-9002 quality standards.

What this priority means to the customer is more reliable products, better service, and more accurate calibrations than they will find anywhere else in the industry!

Customer Service Is Our #1 Priority

Our customer service team is committed to giving you the best service possible. Our high-precision calibration and repair services give you the confidence that our equipment will keep on performing for you year after year.

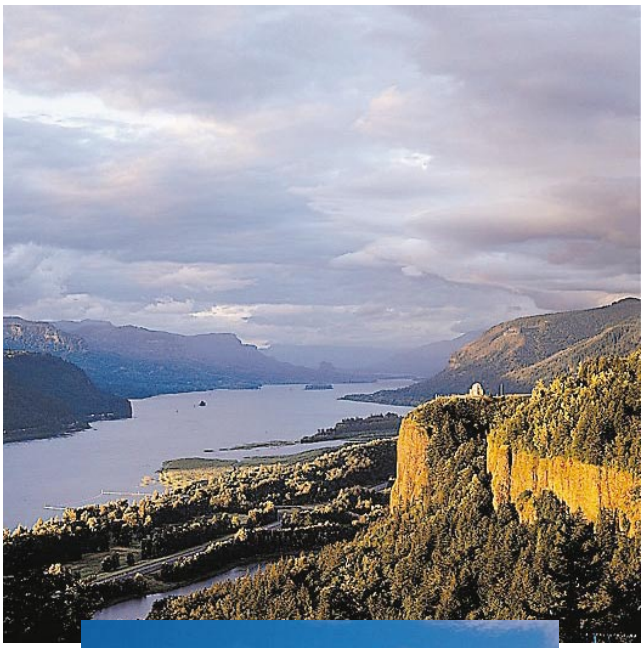
With our Lifetime Warranty you are automatically covered when you purchase one of our power meters, so you will never incur an unexpected big repair bill – laser damage and abuse are the only exceptions. When you need a calibration and/or repair call us for an RMA # to return it.

We have a quick 5-10 working day turnaround on most repairs, and if you really need it faster, we offer a 24- or 48-hour expedited service. Contact us for details.

Warranty

Our unique Lifetime Warranty is a *first* in our industry. We only ask that you return the product on an annual basis for recalibration as recommended by NIST and the ISO 9002 standard. For a nominal fee we will recalibrate your probes and instruments and repair anything needed. This includes replacing battery packs, ICs, EL panels, LCD displays, Power supplies, and µP software upgrades, etc. We'll make the product as good as new at our cost, including parts and labor – which means trouble-free, low cost operation for the life of the product. The only exceptions are laser damage and abuse.

Making this kind of offer, at no cost, is our guarantee to you – we have great confidence in the quality of our laser power probes and meters!



Molectron
DETECTOR, INCORPORATED

7470 SW Bridgeport Rd. Portland, OR 97224-7286
1-800-366-4340 e-mail: info@molectron.com http://www.molectron.com